



Smokey the Drone

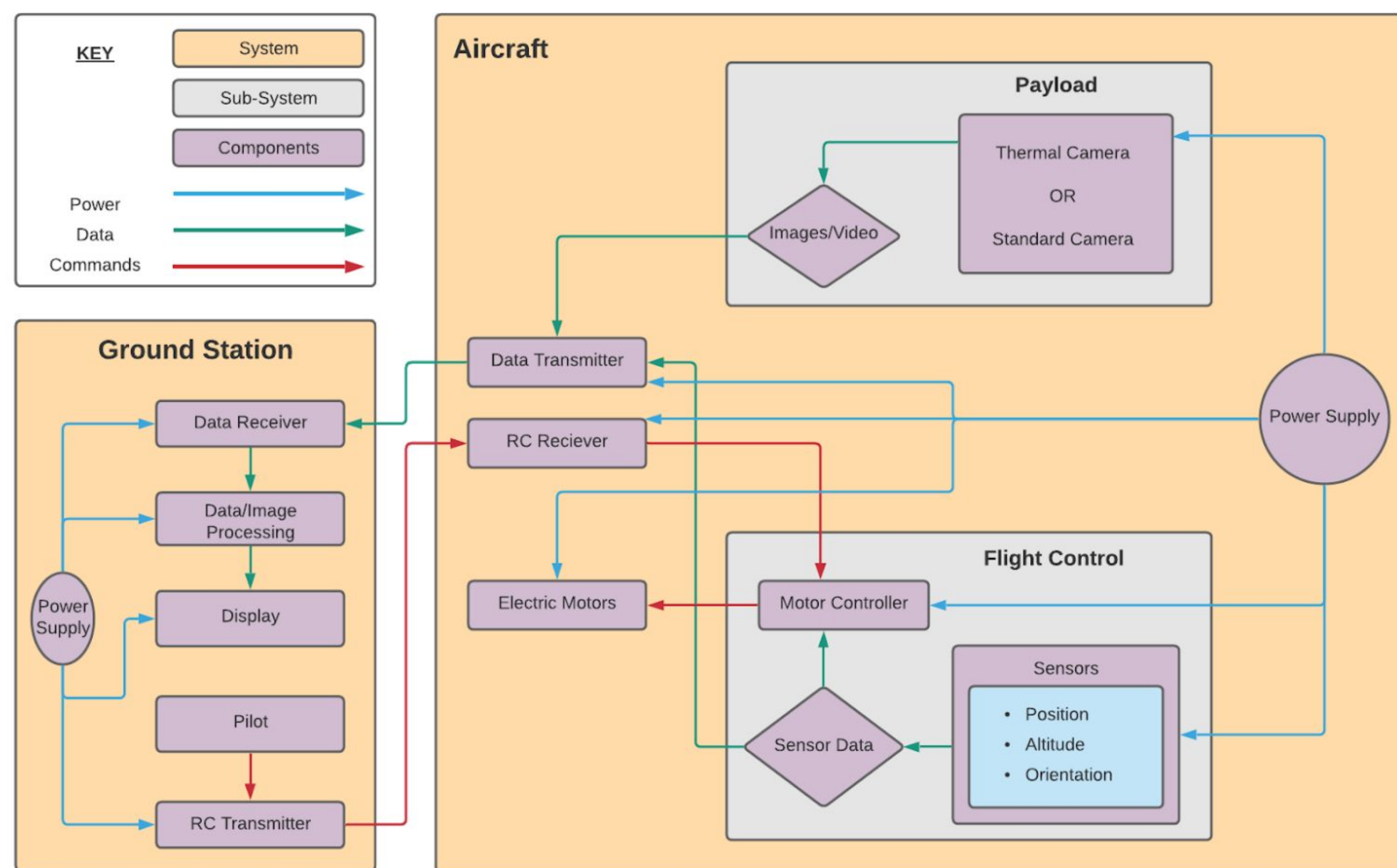
Aerospace Engineering Capstone Senior Design 2020 - 2021

The Smokey Bandits

Anna Jordan, James Einwaechter, Kieran Boudreau, Matthew McClintock, Sager Elliott, Ryan Reeb
 Dr. Felix Ewere - Instructor | Dean Leonard - Course TA | Josh Glazer & Kevin Gitushi - Engineering Trust Fund



Block Diagram

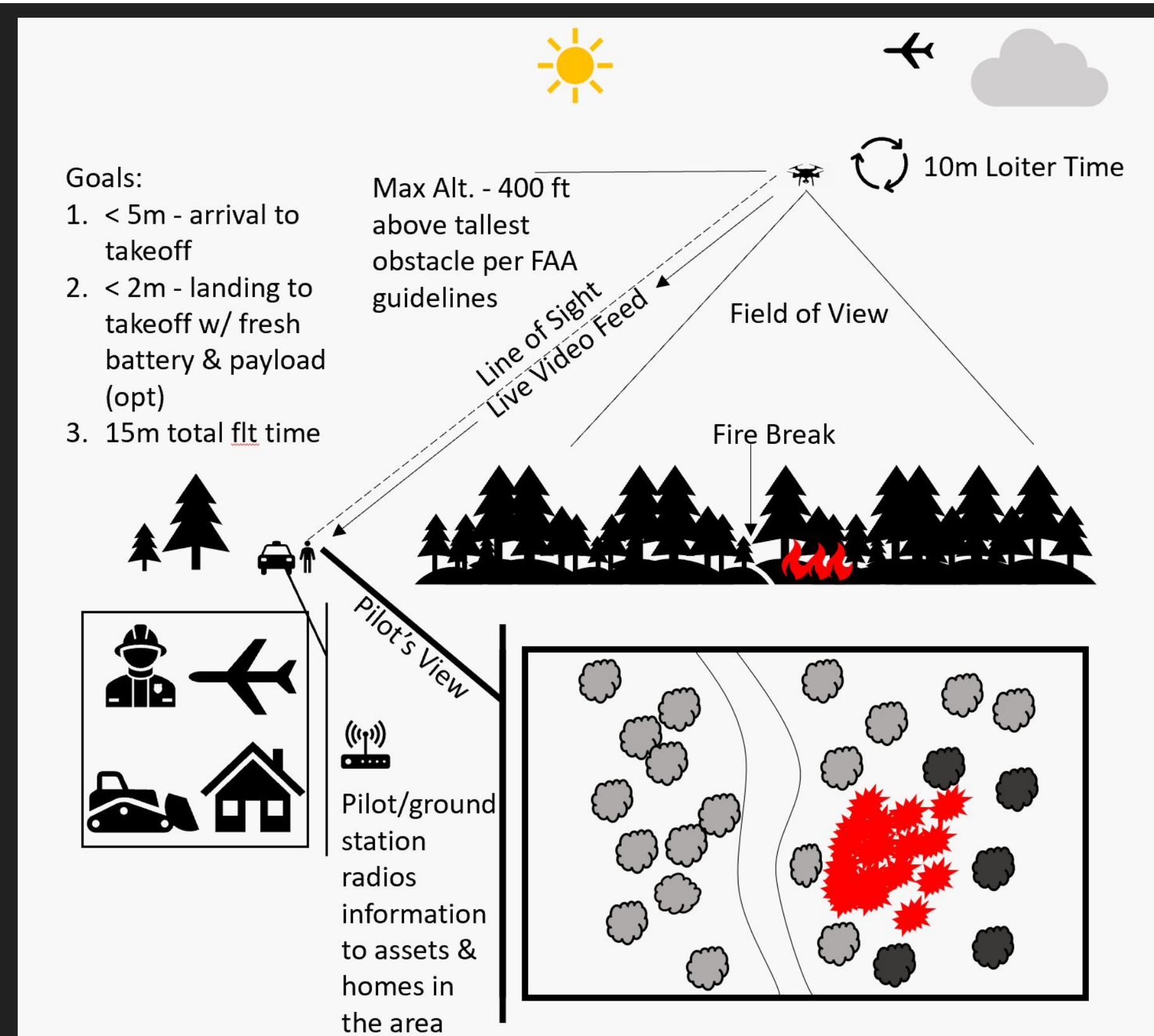


The Functional Block Diagram above shows the main subsystems and components of Smokey the Drone and how components interact with one another.

Functional Prototype

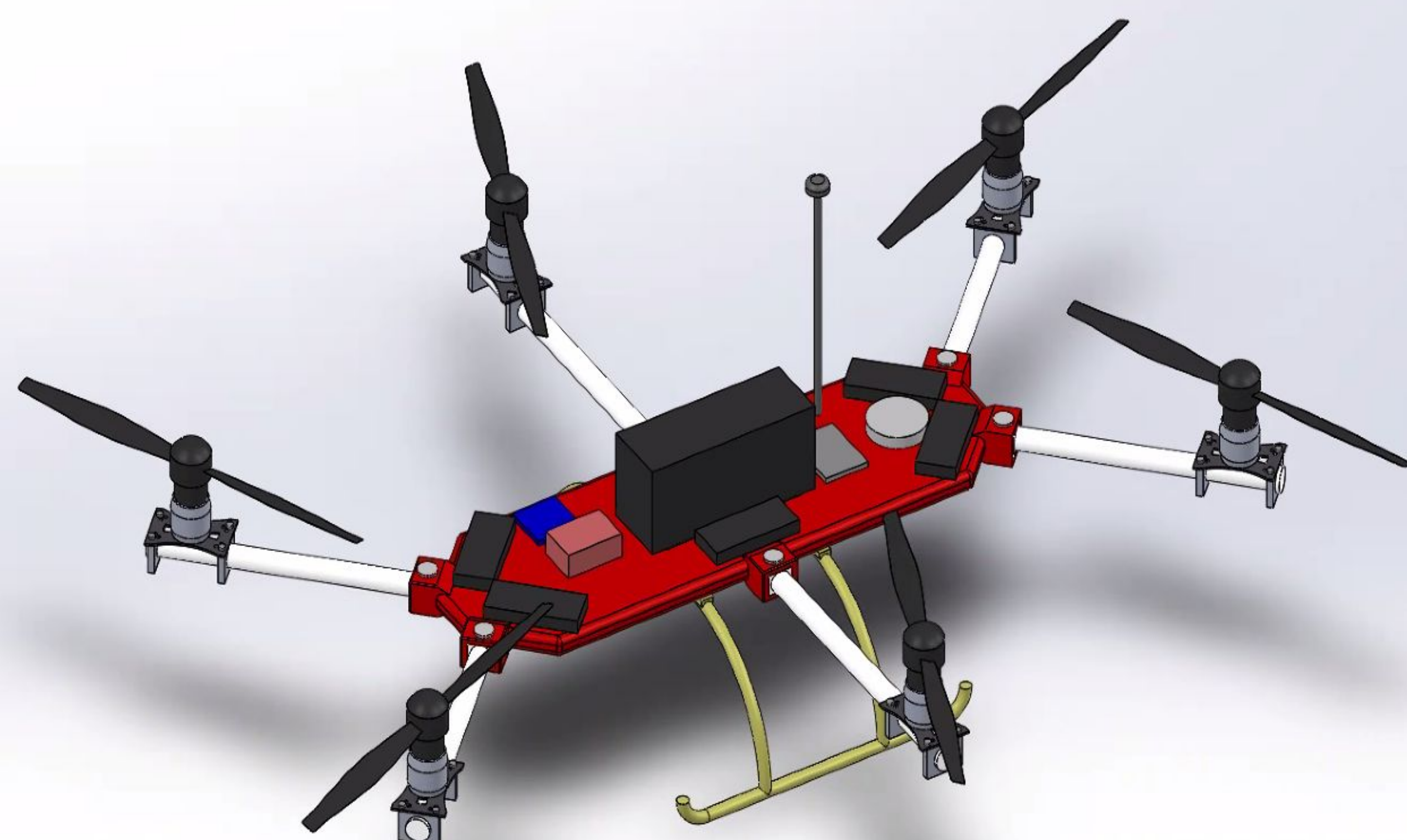


CONOPS



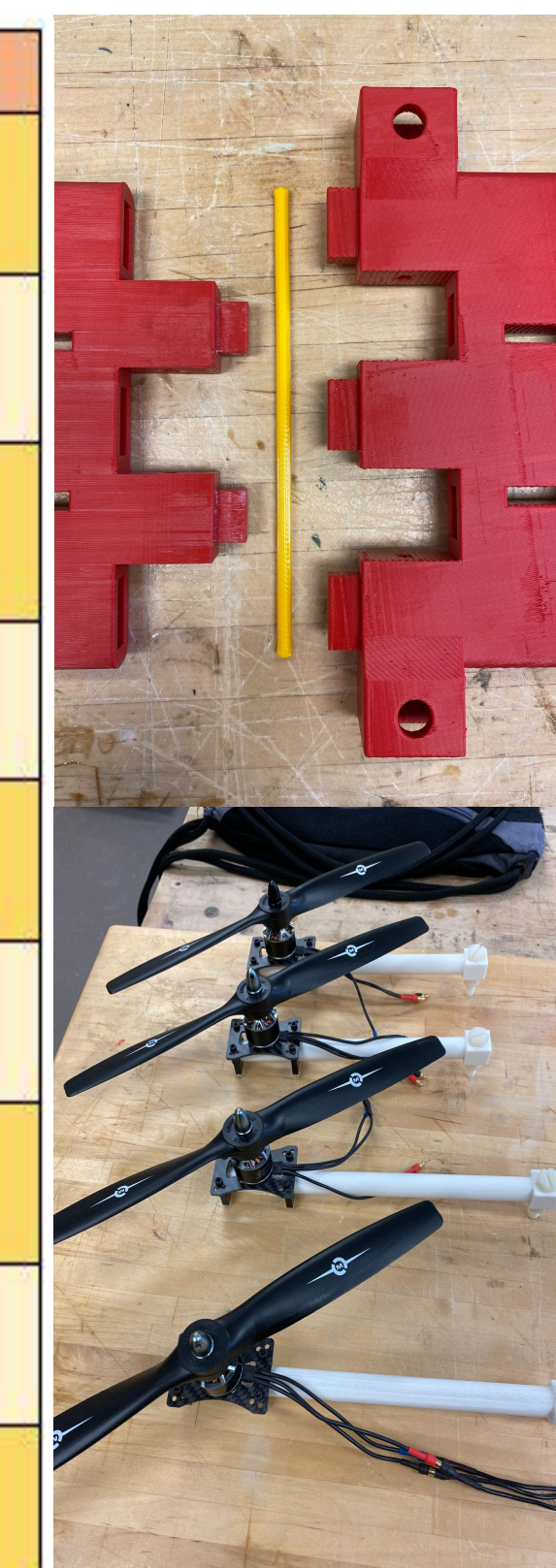
Flight Test #	Approximate Time	Result	Solution	Turn Around Time
# 1	< 5 sec	Landing Gear Failure	Zip-ties, Epoxy, and PVC	1 Day
# 2	2 mins, 30 sec	Success	N/A	N/A
# 3	4 mins	Success	N/A	N/A
# 4	1 min, 35 sec	Propulsion System Failure	3 more booms, tie landing gear	2 Days
# 5	< 5 sec	Erratic "Behavior"	1 more boom, re-zip tie landing gear	< 1 Day

CAD Design Model



Manufacturing

Component	Manufacturing Process	Equipment	Schedule
Frame Components	3D print frame pieces, booms, and landing gear	3D printer, Computer	Jan. 19 th - Feb. 4 th
Assemble Booms	Attach motors, propellers, and ESC's to the booms	Screwdriver,	Jan. 25 th - Feb. 5 th
Assemble the frame	Secure the 2 frame pieces together	Sandpaper & Epoxy	February 1 st -12 th
Battery	Center the battery on the frame	Velcro straps, glue	February 15 th -19 th
PDB	Solder electronic components to PDB	Soldering machine	February 15 th -26 th
Flight Controller	Configure flight controller, receiver	Computer	March 1 st -5 th
Assembly	Connect the booms and landing gear to the frame	Screwdriver, Epoxy kit	March 1 st - 5 th
Payload	Connect and wire the camera to the gimble	Screwdriver	March 6 th -10 th
Enable VTX	Connect the VTX for in-flight transmission	Ground module	March 6 th -10 th



Testing

Test	Objective	Results
Boom Thrust Obstruction Test	Compare aerodynamic performance of propeller/motor assembly with and without boom	The thrust produced with the boom is more than 94% of the thrust produced without the boom.
Static Thrust Test	Verify thrust produced from propulsion system is sufficient for operations	Thrust produced indicates takeoff at about 60-65% throttle
Assembly Test	Verify customer size requirement	Drone fits in sedan trunk and is fully assembled within 1 minute
Center of Gravity Test	Verify center of gravity falls within the drone body and below propeller line	CoG deviates towards the front of the drone but within the drone body and below propeller line
Electronic Lab Test	Verify electrical components connection to avionics and propulsion system	No short circuits or problems with either the PDB or the soldered connections
Boom Deflection Test	Verify each boom will be strong enough to handle propulsive forces generated during flight	The boom deflects more than 2 cm without damage